Site 329 Rings Island – Ferry Road

Overview: The Rings Island – Ferry Road potential restoration site is located to the north of Rings Island approximately 350 ft north of the intersection with March Road in Salisbury. The potential restoration site encompasses approximately 37 acres of salt marsh upstream of the existing crossing of Rings Island Creek under Ferry Road. Ferry Road is an early town road and is shown on the 1894 USGS Newburyport-Exeter, NH-MA Quadrangle map. Rings Island Creek flows in a southerly direction approximately 0.25 mi to the Merrimack River. Ditching within the potential restoration site extends to the south and joins the Rings Island – First Street - Marsh Road Site (Site 328), although flow between the potential restoration sites is limited by the size and condition of the connecting ditches. During major coastal flooding events, as witnessed on May 25th and 26th of this year, water overtops the roadways which separate both sites from the Merrimack River. The undersized stone culvert under Ferry Road restricts tidal exchange during all tides. Tide gauge data collected from mid-May to early June documented a maximum restriction of over 3.0 feet during a major storm event. A restriction of approximately 0.9 ft occurs during typical spring tide conditions. Other evidence of a tidal restriction includes: distinct scour pools both up and downstream of the crossing, bank erosion, impounded conditions upstream of the crossing, and relatively large populations of *Phragmites*. There is also a pronounced decrease in the typical dimensions of the creek upstream of Ferry Road. The approximate width of the channel is 14 and 25 ft upstream and downstream, respectively.

Approximately one-third of the restoration area is owned by the State and is under the management of MassWildlife. The remaining area is privately held. The Ferry Road right-of-way is municipally owned.

Structure conditions: Tidal flow is conveyed under Ferry Road via a 2.3 ft wide by 3 ft high granite block culvert. The culvert shows some signs of seepage and erosion around the upstream and downstream inverts, but the granite blocks appear to be stable. Riprap protects the upstream and downstream inverts of the culverts from erosion and scour. Stones surrounding the inlet and outlet form a cut stone headwall. There were indications that the pavement around the culvert has been recently repaired. This is typically an indication of settlement or loss of material around the culvert through infiltration. The overall culvert is in fair condition. The creek banks upstream and downstream of the culverts are severely eroded and subsequently have large scour pools. This is most likely a result of high velocities through the culvert and the culvert's poor alignment with the creek.

Ecological Integrity: Stands of *Phragmites* are less common within this portion of the Rings Island Marsh in comparison to Site 328 and the site exhibits a medium level of ecological integrity. The potential restoration site receives substantial non-point source runoff from commercial properties along Route 1. These properties have also encroached on (filled) historic salt marsh. MassWildlife owns, but does not actively manage, approximately one-third of the site. The potential restoration site is contained within BioMap Core Habitat and Estimated Habitat for Rare Wildlife. The potential restoration site does not fall within an ACEC. Surrounding land uses are high density residential and commercial. Both Sites 328 and 329 include relatively large stands of *Phragmites* and are therefore considered to be in a degraded condition. Filled wetland areas along Route 1 coupled with stormwater runoff are causing further impairments to the marsh. Loosestrife is also common in several locations within the upper reached of the marsh. Unlike Site 238, Site 239 includes substantial cover of healthy high marsh dominated by *S. patens*.

There are also extensive stands of *Phragmites* within unrestricted portions of the marsh downstream of the road crossings. Smaller stands of *Typha* are occur within unrestricted portions of the marsh. The growth of these brackish species within an unrestricted portion of the marsh system is presumably in response to reduced soil pore water salinities caused by localized hydrogeologic conditions. The areas do not appear to be elevated above typical salt marsh levels. Reduced salinities within the Merrimack River during periods of high runoff may also be a contributing factor.

The elevated invert above the creek bed somewhat restricts upstream fish passage over the lower portion of the flood tide. Rings Island Creek and the Merrimack River downstream of the potential restoration site is mapped as suitable habitat for blue mussel and soft-shelled clam.

Two tide gauges were deployed from May 18 to June 3, 2005 upstream and downstream of the culvert under Ferry Road. Results of the gauge deployment show a significant restriction of tidal flow through the culvert which increases with tidal prism. These restrictions occurred during all of the 29 tidal cycles recorded for this deployment. Tidal restrictions ranged from 0.88-3.28 ft and delays ranged from 16 min to 2 hr 6 min. The highest recorded tide downstream of the culvert occurred during a major coastal storm on May 26 at 2:00 AM at an NGVD adjusted height of 8.87 ft. Upstream high tide occurred at 4:06 AM at an adjusted height of 5.76 ft. During the peak of the tidal cycle, the roadway system was overtopped causing a pronounced delay in the ebb tide upstream of Ferry Road. The resulting tidal dampening was 3.11 ft. and a delay of 2 hr 6 minutes. The dampening amounted to approximately 33.1% of the total tidal prism recorded at the downstream gauge. The only larger restriction recorded was 3.28 ft on May 25 during the morning tide. This restriction amounted to 35.1% of the total tidal prism recorded at the downstream gauge. The dampening effect provided some flood protection to relatively low-lying properties along Route 1 and north of the crossing along Ferry Road. The tidal restriction during more typical spring tide conditions (similar to the tide which reached elevation 5.5 ft on May 22nd) is approximately 0.9 ft.

Relatively low salinities of 2.6 and 1.8 ppt (downstream and upstream, respectively) were recorded on a near slack, ebbing tide. These values are indicative of significant freshwater contributions to the marsh system, especially during spring conditions. The very low salinities may also be attributable to fresh water contributions from the Merrimac River.

The overall severity of the existing impairments within this portion of the marsh system is considered moderate. The replacement of the existing culvert with a larger structure set lower in the channel would reduce the tidal restriction and the bank erosion observed at the crossing. The lack of healthy high marsh downstream of Ferry Road near the crossing prevented an accurate comparison of salt marsh biological benchmarks. Ground elevations recorded on both sides of the crossing did not indicate signs of major subsidence; however, some subsidence would be anticipated given the recorded tidal restrictions during typical spring tide conditions. Even with additional ditching within the potential restoration site to increase tidal exchange and draining of fresh water which likely accumulates, especially within the upper reaches of the marsh, the ability to effectively reduce the cover of *Phragmites* is questionable. Without restoration, however, the amount of *Phragmites* would be expected to increase similar to downstream conditions. An increase in tidal amplitude and improved fish passage will increase available habitat for foraging fish. An alleviation of the tidal restriction will also allow the marsh plain to increase in elevation in response to rises in sea level. Minor conversion of fresh water wetlands are anticipated. These impacts would generally be beneficial due the prevalence of loosestrife within this habitat type. Small stands of *Typha* within the Rings Island Marsh would likely not be impacted. Additional study will need to evaluate the impact of increased tidal exchange on low-lying properties.

Socioeconomic: Recreational values of the potential restoration site are reduced by poor access and lack of parking but somewhat enhanced by the partial public ownership status. The scour pool upstream of the crossing is well known locally as a site to collect baitfish (*Fundulus* sp.). There are limited educational opportunities due to the lack of nearby schools or ongoing research. The potential restoration site's Uniqueness/Heritage value is enhanced by its listing as supporting State-listed wildlife. The potential restoration site does not include any known cultural resource elements or urban setting values.

Construction Logistics/Feasibility: Constructability at this potential restoration site is considered high. The Town would allow Ferry Road to be closed to traffic during construction (D. Levesque, DPW Director, pers. comm.). A 4 in sewer main under Ferry Road will have to be either relocated or supported during construction. This force main would not constraint the ability to place a large structure at the crossing. Overhead electric, cable and telephone also run along Ferry Road. Depending on the cofferdam system used at the site, these utilities might have to be temporarily relocated. There are limited staging areas adjacent to the potential restoration site. The nearest location is an open lot or field approximately 1,500 ft north of the existing culvert on the east side of Ferry Road. Ferry Road itself could also be used for some limited staging as it would be closed to traffic.

To increase tidal flow, the existing stone box culvert will have to be replaced with a larger box culvert set lower in the creek channel. The new culvert should also be placed to the north to be better aligned with the creek. This would allow the existing structure to remain in place during construction and avoid the need to construct a temporary bypass. For initial cost estimates we assumed an 8 ft high by 10 ft wide concrete box culvert. A larger structure may be possible pending further modeling and investigations of low-lying abutters. Construction costs associated with replacing the culvert are estimated to be in the range of $550,000. This effort also assumed some additional work within the upper reaches of the marsh to improve tidal circulation and draining of accumulated fresh water. Additional work within the Rings Island Marsh to improve hydraulic connections to the adjacent potential restoration site is discussed under Site 328.

Restoration Potential: The potential restoration site is considered to have high restoration potential based on the presence of several important socioeconomic factors including the partial conservation status and the extent of the existing tidal restriction. Although the potential restoration site currently has a moderate level of ecological integrity and supports State-listed rare species, there is the distinct potential for many of the observed impairments to worsen without restorative actions. There are also relatively few construction implementation drawbacks, however further coordination with several land owners and more detailed information on flooding concerns are necessary to confirm these assumptions. Additional studies of restoration potential should also include:

- an investigation of soil pore water salinities upstream and downstream of road crossings to better understand vegetation responses to salinities levels,
- an investigation of potential sources of stormwater contributions along Route 1,
- more detailed survey and topographic information on low-lying abutters and existing utilities, and
- coordination with the Town, property owners and MassWildlife to identify cost-sharing opportunities.

Site # 329 | Site Features | Scale: 1:2,500

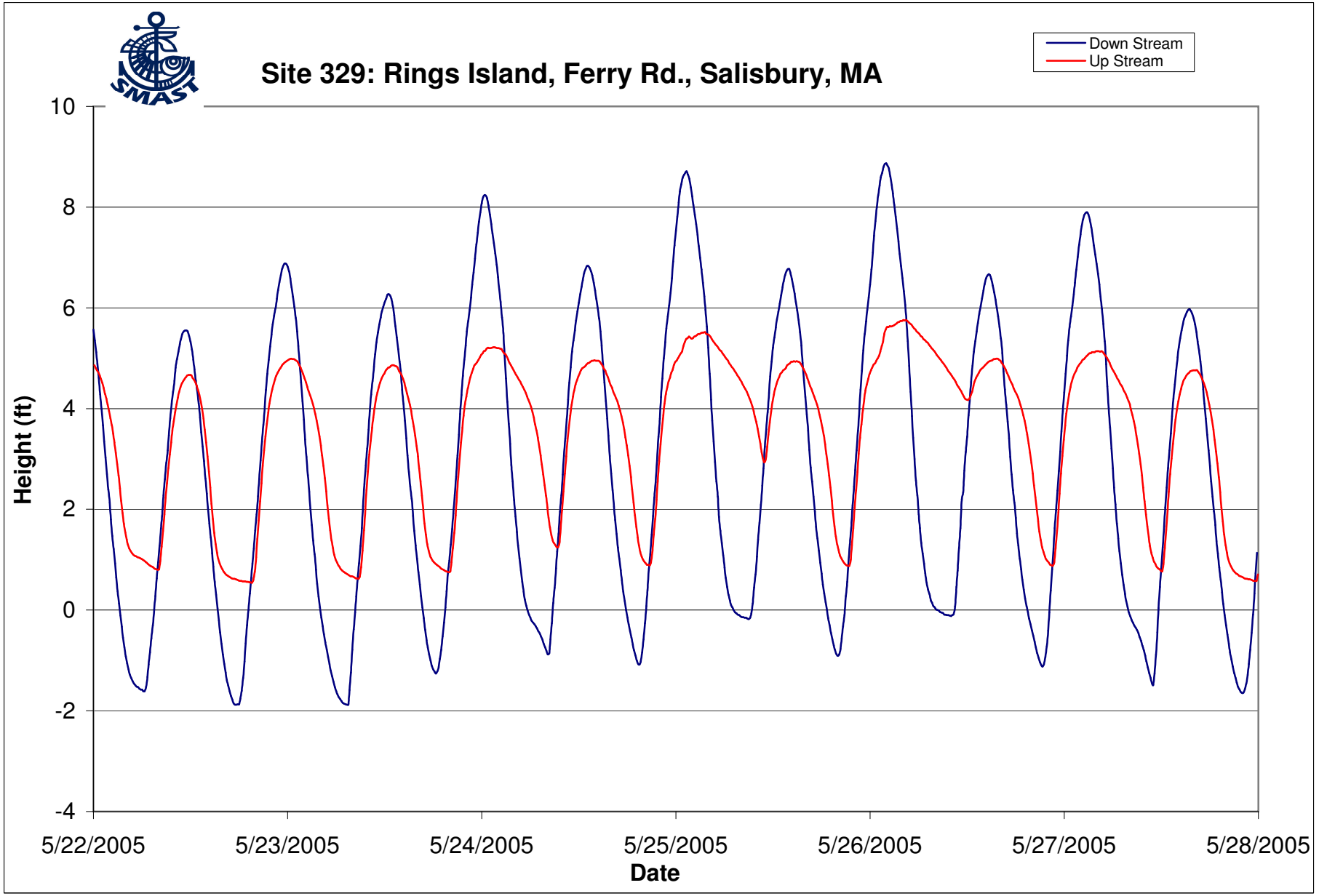
Photo 1 - Ferry Road at Culvert Crossing Viewing North

Photo 2 - Upstream View of Culvert Crossing

Photo 3 - Downstream View of Culvert Crossing

Photo 4 - Rings Island Creek Downstream of Crossing

Photo 5 - View of Restoration Area from Crossing


Site 329: Rings Island, Ferry Rd., Salisbury, MA
Down Stream
Up Stream
Height (ft)
10
8
6
4
2
0
-2
-4
5/22/2005
5/23/2005
5/24/2005
5/25/2005
5/26/2005
5/27/2005
5/28/2005
Date

Great Marsh Coastal Wetlands Restoration Planning

Rapid Field Assessment

Site # 329

Rings Island - Ferry Road

Site Information

Site ID:	329
Site Name:	Rings Island - Ferry Road
Municipality	Salisbury
Location:	North of Rings Island, 350 ft north of intersection with Ferry Road
Adjacent Waterbody:	Merrimack River

Affected Area (Acres)

Mudflat/Open Water:	0	Total Area:	34.1
Salt Marsh:	34		
Other Wetland:	0	*Other Description:*	
Other:	0.1	Fill	

Impairment(s)

Tidal Restriction	☑	Fill	☑
Obstructed Ditche(s)	☐	Invasive Species	☑
Impoundment	☑	Pollution / Siltation	☑

Severity of Impairments: Moderate

Project Type

Roadway Culvert(s)	☑	Obstructed Ditches	☑
Bridge	☐	Fill	☐
Berm	☐	Other	

Evidence of Restriction

Gauge Data	☑	Impounded Flow	☑
Downstream Scour Pool	☑	Obstructed Flow	☐
Upstream Scour Pool	☑	Invasive Species	☑
Bank Erosion	☑	Ponded Conditions	☐
Slumping	☐	Subsidence	☐

Structure / Channel:

Overall Condition:	Fair
Life Expectancy (Years):	15
Road Condition:	Fair
Structure Type:	stone box culvert
Structure Age (Years)	50
Structure 1 Width (Feet):	2.3
Structure 1 Length (Feet):	40
Structure 2 Width (Feet):	
Structure 2 Length (Feet):	
Skew (Degrees):	0
Cover (Feet):	4.6
Scour Protectection:	☑
Adequately Aligned:	☐
Headwall Type:	Cut Stone
Headwalll Condition:	Fair

Ecological Integrity / Habitat Value

Surrounding Land Use %

Commercial / Industrial	40
Residential	60
Agricultural	0
Undeveloped	0

Severity of Impairment(s)	Moderate
Invasive Plant Cover:	Low
Extent of Wooded Buffer:	Fair
Habitat Connectivity:	Fair
NHESP Estimated Habitats of Rare Wildlife:	☑
NHESP Priority Habitats of Rare Species:	☑
NHESP BioMap Core Habitat:	☑
NHESP BioMap Supporting Natural Landscape:	☐
ACEC:	☐
Anadromous Fish:	☐
Shellfishing Suitability:	☑
Barriers to Fish Passage	Minimal

Great Marsh Coastal Wetlands Restoration Planning

Rapid Field Assessment

Site # 329

Rings Island - Ferry Road

Construction Logistics / Feasibility

Traffic Volume	Medium
Detour Potential	☑
Site Access	Good
Staging Areas	☑
Fill Material Concern	Minimal
Low Lying Property Concerns	Moderate
Overhead Utility Constraint	Moderate

Underground Utilities

Water	☐	*Telephone*	☐
Gas	☐	*Sewer*	☑
Electric	☐	*Drainage*	☐

Permitting Complexity	Medium
Local Support	Yes
Feasibility Cost	25,000
Design Cost	35,000
Permitting Cost	25,000
Construction Cost	550,000
Total Cost	640,000
Relative Cost/Acre	19,000

Socioeconomic

Recreation

Public Access:	☑
Watercraft / Portage:	☐
Wildlife Viewing:	☑

Education

Schools Nearby:	☐
Ongoing Research:	☐
Education / Outreach Potential:	Low
Saftey Concerns (Access):	Medium

Uniqueness / Heritage Value

Rare Species Habitat:	☑
ACEC:	☐
Cultural Resource Features	☐
Urban Viewscape Value:	None
Urban Habitat Value:	None

Tide Surveys

	Start:		*Finish:*
Dates of 1st Survey:	5/18/2005	-	6/3/2005
Date of Highest Tide:	5/25/2005		
Max Measured Tidal Dampening:	3.28		
Percent of Tidal Prism:	35		
Measured Delay:	2 hr 6 min		

	Start:		*Finish:*
Dates of 2nd Survey:		-	
Date of Highest Tide:			
Max Measured Tidal Dampening:			
Percent of Tidal Prism:			
Measured Delay:			

Summary

Uniqueness / Heritage Value:	Medium	Ecological Integrity:	Medium
Recreational Value:	Medium	Logistics / Feasibility:	High
Educational Value:	Low		

Restoration Potential: High